THE CONSUMER WELFARE IMPACT OF M2Z NETWORKS INC.'S WIRELESS BROADBAND PROPOSAL

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I.   EXECUTIVE SUMMARY

On May 5, 2006, M2Z Networks, Inc. ("M2Z") filed an application with the Federal Communications Commission ("FCC" or "Commission") for a 15-year license to lease 20 MHz of unpaired spectrum in the 2155-2175 MHz band to provide a free nationwide wireless broadband service. The 2155-2175 MHz band is a single spectrum block that the Commission concluded would be suitable for Advanced Wireless Services in 2001. Since that time, no spectrum assignment has been made and there is no current Commission proceeding to determine the rules for its designated long-term use. As such, the 2155-2175 MHz band could continue to be underutilized for years to come. M2Z's proposal offers the Commission the opportunity to ensure full use of the spectrum in a way that promotes consumer welfare.

The stated goals of M2Z's proposal are to build a network that will provide consumers with broadband access services using an advanced version of the World Interoperability for Microwave Access ("WiMax") protocols. According to M2Z's proposal, M2Z will offer a free service, which will be comparable to basic DSL service, and will provide affordable access to broadband service to almost all U.S. households. Additionally, M2Z plans to offer a faster (3 Mbps) paid subscription service. Both the free and paid subscription services will increase the level of broadband competition in the country, providing significant benefits to U.S. consumers. This study analyses some of the effects of M2Z's entry into the market for broadband access on consumers of broadband and telecommunications services.

The central goal of public policy decisions at the FCC and other regulatory agencies is to ensure that the benefits of any particular decision outweigh its costs. The

entry of a new national facilities-based competitor in the market for broadband access services is likely to have profound and long lasting effects. Given the uncertainty in predicting the effects of M2Z's entry with a service that is not yet available, in order to provide a useful benchmark for the debate relating to M2Z's proposal, I have developed a very conservative framework to estimate the net present value of consumer benefits that will likely result from the first-order effects of M2Z's entry.

I focus on three important first-order effects of M2Z's entry on consumers: (1) benefits to consumers of broadband services due to lower prices; (2) benefits from increased broadband access via either (a) the provision of broadband access to consumers without prior access to broadband or (b) an avoided new broadband USF tax; and (3) royalty payments for the spectrum to be leased by M2Z.

Thus, I am not explicitly accounting for numerous other potential consumer benefits from M2Z's service. For example, when estimating the benefits to consumers from increased broadband access, I only consider the benefits to consumers who subscribe to M2Z's free service but did not have prior broadband access. This ignores the individual utility benefits to consumers who choose to purchase M2Z's paid subscription service as well as benefits to consumers who had broadband access prior to M2Z's entry (e.g., consumers who had access to broadband but chose to subscribe to dial-up service). In addition, I only consider the effect of M2Z's entry on other broadband providers via reduced prices for broadband access. That is, I do not consider the effects of M2Z's entry on the incentives of existing broadband providers to innovate and invest in their networks. Moreover, I am not accounting for the significant but less tangible consumer benefits from increased innovation and investment in other industries

as a result of increased and cheaper broadband access for U.S. consumers due to M2Z's service.

This very conservative approach to estimating the consumer benefits from M2Z's proposal suggests that M2Z's entry will likely result in a net present value ("NPV") as of 2007 of benefits to U.S. consumers of broadband and telecommunications services ranging from more than $18 billion to more than $25 billion.

Specifically, I estimate the NPV of benefits to broadband subscribers from M2Z's service due to a reduction in broadband access prices of more than $13 billion from 2008 onwards. In addition, I estimate the NPV of benefits to consumers of broadband and telecommunications services from increased broadband access made possible by M2Z's free service ranging from more than $5 billion to more than $12 billion over the period 2008 to 2022. Moreover, I conservatively estimate the NPV of benefits from royalty payments for the spectrum to be leased by M2Z ranging from more than $35 million to more than $536 million from 2008 onwards (under less conservative assumptions regarding M2Z's paid subscribers, the estimated NPV of these royalty payments ranges from more than $71 million to more than $1 billion).

II.   QUALIFICATIONS AND INTRODUCTION

My name is Simon J. Wilkie. I am Executive Director of the Center for Communications Law and Policy and Professor of Economics at the University of Southern California. From 2002 to 2003, I served as Chief Economist at the Federal Communications Commission. In that capacity, I oversaw the economic analysis performed by the Commission staff and advised the Chairman and Commissioners on issues involving economic analysis. Major items before the FCC during my tenure included the EchoStar/DirecTV transaction, the Comcast/AT&T Broadband transaction, the Triennial Review of Unbundling Obligations, and the Biennial Review of Media Ownership rules.

Previously, I was an Assistant Professor and Senior Research Associate in Economics at the California Institute of Technology. Prior to joining the faculty at the California Institute of Technology, I was a Member of Technical Staff at Bell Communications Research. I have also held the positions of Affiliated Scholar of the Milken Institute and Visiting Assistant Professor at Columbia University. Over the past fifteen years, my academic research has focused on the areas of mechanism design, regulation, and game theory. I specialize in analyses involving industrial organization, regulation, public finance, and the design of institutions, with particular applications to the economics of telecommunications and network industries. I have conducted economic research and prepared testimony on a variety of antitrust and regulatory issues in a number of industries, including the telecommunications industry. I have also consulted on matters involving mergers and acquisitions in the satellite and the cable industries, and on issues related to local service and wireless competition. My research

has appeared in a number of academic journals, including the *Review of Economic Studies, The Journal of Economic Theory, The Journal of Economics and Management Strategy,* and *The Journal of Industrial Economics*. I received a Bachelor of Commerce degree (Honors) in Economics from the University of South Wales, Australia, and my M.A. and Ph.D. degrees in Economics are from the University of Rochester.

I have been asked by M2Z Networks, Inc. ("M2Z") to evaluate the consumer welfare impact of its proposal to provide nationwide wireless broadband service. This paper is organized as follows. In section III below, I briefly summarize the key aspects of the application filed by M2Z to provide nationwide wireless broadband service[1] as well as the estimated benefits to consumers if M2Z's proposal were to be approved by the FCC. In Sections IV, V, and VI, I describe how I estimated the consumer benefits from M2Z's proposal. My conclusions are presented in Section VII. Appendix One presents the details of the calculations underlying my analysis. A copy of my Curriculum Vitae is attached as Appendix Two.

III.   M2Z'S PROPOSAL AND ITS CONSUMER BENEFITS

M2Z's Application envisions the introduction of a nationwide wireless broadband service based on the WiMax technology standard utilizing the 2155-2175 MHz frequency band. M2Z's service would comprise of (1) a free service comparable to basic DSL service and (2) a paid subscription service with faster data transfer rates. Both the free and paid subscription services would require consumers to purchase a certified reception

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[1] See, M2Z Networks Inc., APPLICATION FOR LICENSE AND AUTHORITY TO PROVIDE NATIONAL BROADBAND RADIO SERVICE IN THE 2155-2175 MHZ BAND, Amended on September 1, 2006, hereinafter "M2Z's Application" or "M2Z's Proposal", available at http://www.m2znetworks.com/xres/uploads/documents/M2Z-Amended-Application.pdf (website visited on January 29, 2007).

device (estimated to cost $250 initially, with lower costs over time) and register with M2Z. Thereafter, there would be no recurring cost for consumers of M2Z's free service beyond the cost of purchasing a certified reception device. Consumers would be required to make monthly payments only for the paid subscription service. M2Z's Application commits M2Z to a network build-out requirement such that M2Z's service would cover 33 percent of the U.S. population within three years, 66 percent of the U.S. population within five years, and 95 percent of the U.S. population within ten years.[2]

Below, I estimate the net present value ("NPV") of some of the consumer benefits from the introduction of M2Z's service. I focus on three important effects of M2Z's entry on consumers: (1) benefits to consumers of broadband services due to lower prices (i.e., the additional competition provided by M2Z will result in lower prices for broadband services generally); (2) benefits from increased broadband access via either (a) the provision of broadband access to consumers without prior broadband access or (b) an avoided new broadband USF tax; and (3) royalty payments for the spectrum to be leased by M2Z equaling 5 percent of M2Z's gross revenues from its paid subscription service.

I note that there are numerous additional consumer benefits from M2Z's entry that I do not consider in this paper. For example, when calculating the benefits to consumers from subscribing to M2Z's services, I only consider the benefits to consumers who subscribe to M2Z's free service and previously did not have broadband access. That is, I ignore (a) the benefits to subscribers of M2Z's paid subscription service and (b) the benefits of subscribing to M2Z's free service for consumers who previously had broadband access (for example, consumers who had broadband access but chose to

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[2] See, M2Z's Application, pp. 2-12.

subscribe to dial-up service). This latter benefit could be considerable, since there were an estimated 25 million dial-up subscribers in 2006.[3] Although some of these dial-up subscribers are located in areas where there is no broadband terrestrial network, and hence are included in my calculations, many of these dial-up users are not included in my calculations, and yet are likely to gain from M2Z's provision of free broadband access.

In addition, when estimating the effect on the market for broadband access of the entry of an independent facilities-based provider of nomadic broadband services, I restrict attention to the effect of M2Z's entry on the price of broadband access. That is, I do not consider the effects of M2Z's entry on the investment incentives of existing broadband providers. I understand that some carriers are considering the possibility of developing wireless broadband networks that would be substitutes to terrestrial broadband access, but it is not clear when or if such networks would begin providing nationwide broadband access to consumers. Thus, the entry of an independent facilities-based provider of broadband access that offers a direct substitute to the "cable and telephone broadband duopoly"[4] may well invigorate the market for broadband access and result in numerous additional, albeit uncertain, benefits to consumers (e.g., increased investment to upgrade existing broadband networks, improved product quality and customer service, etc.). Furthermore, given convergence across the markets for broadband and traditional telecommunications as well as subscription TV into bundled product offerings, by

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[3] I rely on estimates used in M2Z's business plan, according to which there were approximately 25 million dial-up subscribers, representing approximately 22 percent of U.S. households in 2006. I note that these estimates appear to be consistent with historical data regarding the number of dial-up subscribers. For example, a Government Accountability Office report found that 30 percent of surveyed households subscribed to dial-up service in 2005. See, Government Accountability Office, BROADBAND DEPLOYMENT IS EXTENSIVE THROUGHOUT THE UNITED STATES, BUT IT IS DIFFICULT OF ASSESS THE EXTENT OF DEPLOYMENT GAPS IN RURAL AREAS, GAO-06-426, May 2006, p. 3.

[4] See, CRS Report for Congress, Order Code RL33496, Access to Broadband Networks, Updated August 31, 2006, p. 17.

providing a complimentary independent "information pipe" to the home, M2Z's entry could result in consumer benefits in markets beyond just broadband access.

Moreover, I ignore the consumer benefits from increased innovation and investment in other industries as a result of increased and cheaper broadband access for U.S. consumers. For the foregoing reasons, my estimates of the consumer benefits from M2Z's proposal are likely very conservative.

Table One below summarizes my estimates of the net present value of consumer benefits from M2Z's Proposal. As seen in Table One, I examine two scenarios. In Scenario 1, I assume that no new broadband USF tax would be imposed in the absence of M2Z's free service. In Scenario 2, I assume that a new broadband USF tax would be imposed in the absence of M2Z's free service. Also as seen in Table One, I find that M2Z's Proposal will result in a net present value of consumer benefits ranging from more than $18 billion to more than $25 billion. The next three sections of this report describe how I estimated the consumer benefits presented in Table One.

Scenario 1: New Broadband USF Tax Not Imposed in the Absence of M2Z's Free Service				
	Net Present Value of Consumer Benefits from M2Z's Proposal ($ million)			
	Total M2Z Customers (million)			
Consumer Benefit Category	1	5	10	15
NPV of Benefits from M2Z's Service Due to Reduction in Broadband Access Prices (2008 onwards) ($ million)	13,115	13,115	13,115	13,115
NPV of Benefits from M2Z's Free Service for Consumers Without Prior Broadband Access (2008-2022) ($ million)	12,318	12,318	12,318	12,318
NPV of Royalty Payments for M2Z's Spectrum Lease (2008 onwards) ($ million)	36	179	358	536
Total NPV of Consumer Benefits ($ million)	25,469	25,612	25,791	25,970

Scenario 2: New Broadband USF Tax Imposed in the Absence of M2Z's Free Service				
	Net Present Value of Consumer Benefits from M2Z's Proposal ($ million)			
	Total M2Z Customers (million)			
Consumer Benefit Category	1	5	10	15
NPV of Benefits from M2Z's Service Due to Reduction in Broadband Access Prices (2008 onwards) ($ million)	13,115	13,115	13,115	13,115
NPV of Benefits from M2Z's Free Service Due to Avoided Broadband USF Tax (2008-2022) ($ million)	5,172	5,172	5,172	5,172
NPV of Royalty Payments for M2Z's Spectrum Lease (2008 onwards) ($ million)	36	179	358	536
Total NPV of Consumer Benefits ($ million)	18,323	18,466	18,645	18,824

IV.   BENEFITS FROM M2Z'S SERVICE DUE TO REDUCTION IN BROADBAND ACCESS PRICES

M2Z's Proposal has the potential to dramatically alter the pattern of competition in the market for broadband access. As of June 30, 2006, approximately 94 percent of broadband connections in the U.S. were provided by cable and telephone companies.[5] Thus, there appears to be a "cable and telephone broadband duopoly"[6] in the U.S.

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[5] According to the most recent FCC report pertaining to High-Speed Services for Internet Access, out of a total of 64,614,270 high-speed lines, 60,496,807 were provided by RBOCs, other ILECs, and cable modem providers. See, FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2006, January 2007, Table 6.

[6] See, CRS Report for Congress, Order Code RL33496, Access to Broadband Networks, Updated August 31, 2006, p. 17.

The key question facing policy-makers today is whether the existing duopoly structure provides sufficient competition in the market for broadband access in the long-run. Some market analysts suspect that previously announced plans to enter this market, such as those announced by AWS auction winners, Broadband over Power-line ("BPL") providers, and Sprint/Clearwire, may have a minimal impact on the market incumbents.[7] M2Z's entry, however, will alter the duopoly structure of the market for broadband access. Moving from the current situation, where most consumers are served by two broadband providers,[8] to competition among three broadband providers is likely to have a significant impact on price competition, innovation, and investment in the market for broadband access.

I believe that the policy debate surrounding the M2Z proposal should take into account the dynamic effects of M2Z's entry. That being said, I note that modeling these dynamic effects would require speculative assumptions that may confuse the debate rather than illuminate it. For this reason, I have modeled the effect of M2Z's entry in the market for broadband access with a very simple model that requires few assumptions (although it does not account for numerous likely second-order benefits to consumers). Moreover, the assumptions that I do make are very conservative.

I estimate the benefits to consumers of broadband services by assuming that M2Z's entry will lead to a reduction in the price of broadband access in the U.S. I assume that M2Z's entry will result in a decline in the price of broadband access by $1

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[7] See, e.g., UBS Investment Research Report, IS THE BROADBAND DUOPOLY UNDER THREAT, May 10, 2006 and Banc of America Research Brief, BATTLE FOR THE BUNDLE, June 14, 2005.

[8] See, e.g., UBS Investment Research Report, IS THE BROADBAND DUOPOLY UNDER THREAT, May 10, 2006.

per month. Note that this represents a decline in price of only 1.67 percent relative to Comcast's regular monthly price for unbundled cable modem service of $59.95[9] and a decline in price of only 6.67 percent relative to AT&T's bundled monthly price of $14.99 for the "AT&T Yahoo High Speed Internet Basic Package" that requires a one-year commitment as well as subscription to AT&T's voice service.[10]

I consider this assumed price reduction to be conservative in light of the observed declines in the price of wireless telephone services following entry into the duopoly cellular markets beginning in 1995 (between 1994 and 2002, the average revenue per minute declined by approximately 77 percent).[11]

I assume that the full $1 per month reduction in price occurs over time, as M2Z's network is built-out and M2Z acquires broadband subscribers. Thus, the assumed price reduction amounts to only an approximately $0.12 cent per month decline in the price of broadband access in 2008, the first year of M2Z's service, increasing to the full $1 per month assumed reduction in price by 2017. Furthermore, I use an overly conservative estimate of the number of residential broadband subscribers in my calculations. In particular, I assume that the number of residential broadband subscribers grows to 68.9 million by 2010 and remains constant thereafter.[12] I make this overly conservative assumption in order to avoid forecasting the growth in residential broadband subscribers

[9] See, http://www.comcast.com (website visited on 02/28/07).

[10] See, http://www.att.com (website visited on 02/28/07).

[11] The FCC originally licensed two cellular operators in each market area. This cellular duopoly structure persisted until the FCC began licensing broadband PCS licenses in 1995. See, e.g., Thomas W. Hazlett (2003), *Is Federal Preemption Efficient in Cellular Phone Regulation?*, FEDERAL COMMUNICATIONS LAW JOURNAL, vol. 56, no. 1. The approximately 77 percent decline in average revenue per minute is computed from Table 3 in Hazlett (2003).

[12] I rely on estimates of broadband subscribers used in M2Z's business plan. I note that these estimates appear to be in line with estimates from sources such as the Telecommunications Industry Association. See, http://www.tiaonline.org/business/media/press_releases/2006/PR06-22.cfm (website visited on 02/09/07.)

beyond 2010. This assumption alone likely makes my estimate of the consumer benefits from M2Z's entry due to reduced broadband access prices very conservative. Finally, in order to compute the net present value (as of 2007) of consumer benefits, I discount future benefits using an interest rate of 5.1 percent.[13]

Table Two below summarizes the estimated benefits from M2Z's entry on consumers of broadband access due to reduced prices. As seen in Table Two, M2Z's entry will provide a net present value (as of 2007) of benefits to consumers of broadband access of more than $13 billion from 2008 onwards.

TABLE TWO
BENEFITS FROM M2Z'S SERVICE
DUE TO REDUCTION IN BROADBAND ACCESS PRICES

NPV of Benefits from M2Z's Service Due to Reduction in Broadband Access Prices (2008 onwards) ($ million)	13,115.10

I also performed a sensitivity test where I assumed a $5 per month reduction in the price of broadband access due to M2Z's entry, which represents a decline in price of 8.34 percent relative to Comcast's regular monthly price for unbundled cable modem service of $59.95 and a decline in price of 33.36 percent relative to AT&T's bundled monthly price of $14.99 for the introductory price "AT&T Yahoo High Speed Internet Basic Package." I note that even the $5 per month price reduction remains well within the range of the observed outcome in the market for wireless telephone services described

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[13] 5.1 percent represents the 30-year interest rate per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

above. With a $5 per month price reduction, I estimate a net present value (as of 2007) of benefits to consumers of broadband access of more than $65 billion from 2008 onwards.

V. BENEFITS FROM M2Z'S FREE SERVICE DUE TO INCREASED BROADBAND ACCESS

Under M2Z's proposal, free broadband access would become available to 95 percent of U.S. households within ten years. This increase in affordable broadband access can lead to enormous benefits for consumers. In this section, I report estimates of benefits from increased broadband access made possible by M2Z's free service. In particular, I estimate the benefits from M2Z's entry for consumers that do not have access to terrestrial broadband networks. This includes consumers in rural areas where existing broadband networks do not provide access as well as non-rural areas where there is insufficient access provided by incumbent providers.

There is considerable policy debate regarding the nature of the public policy required to increase access to advanced telecommunications services, including broadband access. Currently, there exist four USF programs (High Cost, Low Income, Rural Health Care, and Schools and Libraries programs) that promote the goals of Universal Service, as mandated by the Telecommunications Act of 1996. All telecommunications carriers that provide service internationally and between states contribute to the USF. Although the FCC does not require carriers to recover their contributions from consumers, in practice, consumers of telecommunications services usually end up paying for their carriers' contributions to the USF (consumers are often

billed for "Universal Service" as a line item on their telephone bills).[14] Recently, new

USF programs have been proposed that are aimed at promoting broadband access.[15]

Within the context of this debate, I compute the benefits from M2Z's free service

under two mutually exclusive states of the world. In Scenario 1, in the absence of M2Z's

free service, there would be no new broadband USF tax imposed on consumers of

telecommunications services. In Scenario 2, in the absence of M2Z's free service, a new

broadband USF tax would be imposed on consumers of telecommunications services.

A.   Scenario 1: New Broadband USF Tax Not Imposed in the Absence of M2Z's Free Service

In the case where a new broadband USF tax is not imposed on consumers of

telecommunications services in the absence of M2Z's free service, I estimate the benefits

from M2Z's free service by computing the value of free broadband access to consumers

that had no prior broadband access. I note that my estimate of the benefits from M2Z's

free service does not account for the benefits to a number of consumers, namely those

that had prior broadband access.   These consumers include (a) current broadband

subscribers, (b) current dial-up subscribers, and (c) current internet non-subscribers in

areas where there exists at least one broadband provider by 2008. Some fraction of these

consumers would find it worthwhile to switch to M2Z's free service, which merely

requires the one-time purchase of a certified reception device. As such, my estimated

consumer benefits from M2Z's free service are conservative.

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[14]   See,   e.g.,   http://www.usac.org/fund-administration/about/how-universal-service-fund-works.aspx (website visited on 02/27/07).

[15]   See, e.g., S. 1583 [109th]: Universal Service for the 21st Century Act, text available at http://www.govtrack.us/congress/billtext.xpd?bill=s109-1583 (website visited on 02/21/07).

I assume that five million U.S. households will not have broadband access in the absence of M2Z's free service in the event that there is no new broadband USF tax. I base this assumption, in part, on the fact that in 2006, more than 9 million U.S. homes (i.e., approximately 8 percent of U.S. households) were not passed by the broadband network with the most extensive coverage (i.e., cable modem service).[16] Note that these broadband penetration data are consistent with those reported by the FCC, according to which approximately 93 percent of the cable systems that offer cable TV service also offer cable modem service.[17] Note also, that according to a report by the Government Accountability Office, the FCC data may overestimate broadband access.[18] In addition, the growth in the number of homes passed by cable high-speed data service appears to be leveling off.[19] Moreover, some analysts expect that the geographic extent of the phone companies' fiber networks will be limited, and that the phone companies will rely on legacy DSL networks in more than half of the U.S., which will be subject to increasingly severe bandwidth limitations over time.[20] Since DSL access is generally limited by a

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[16] There were 107,811,000 homes passed by cable high-speed data service and an estimated 117,008,705 U.S. households in 2006. See, http://www.ncta.com/ContentView.aspx?contentId=60 (website visited on 02/15/07) for the number of homes passed by cable high-speed data service. The estimate of U.S. households was used in M2Z's business plan. I note that this estimate appears consistent with historical data for U.S. households available from the Census Bureau.

[17] See, FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2006, January 2007, Table 14.

[18] See, Government Accountability Office, BROADBAND DEPLOYMENT IS EXTENSIVE THROUGHOUT THE UNITED STATES, BUT IT IS DIFFICULT OF ASSESS THE EXTENT OF DEPLOYMENT GAPS IN RURAL AREAS, GAO-06-426, May 2006, for a discussion of why the FCC data may overstate the availability of broadband access, particularly in rural areas.

[19] The number of homes passed by cable high-speed data service was 94,435,000, 101,672,000, 105,547,000, and 107,811,000 in 2003, 2004, 2005, and 2006 respectively. Thus, the rate of growth in the number of homes passed by cable high-speed data service was 7.66 percent in 2004, 3.81 percent in 2005, and 2.15 percent in 2006. See, http://www.ncta.com/ContentView.aspx?contentId=60 (website visited on 02/15/07).

[20] See, Bernstein Research, Craig Moffett, THE DUMB PIPE PARADOX, CONFERENCE CALL MATERIALS, February 21, 2007.

consumer's distance from the phone company's Central Office,[21] it follows that the number of homes that have access to cable high-speed data service is a reasonable estimate of terrestrial broadband access. Thus, I believe that it is reasonable to assume that five million U.S. households will not have broadband access in the absence of M2Z's free service in the event that there is no new broadband USF. Note that this represents less than 4.3 percent of U.S. households in 2006, and that this percentage can be expected to decline as the number of U.S. households grows over time.

I also assume that the willingness to pay for broadband access for these five million households is uniformly distributed between $59.99 and zero dollars per month, based on the lowest monthly price of service for non-bundled high-speed internet service available from satellite provider Hughes Network Systems.[22] Using these assumptions, I estimate an annual benefit to consumers from M2Z's free service of approximately $1.8 billion.[23] I assume that this benefit would be available to consumers at the rate at which M2Z's network is built-out.

Based on the foregoing assumptions and discounting future benefits using an interest rate of 5.05 percent,[24] I estimate that the net present value (as of 2007) of benefits

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[21] See, e.g., Government Accountability Office, BROADBAND DEPLOYMENT IS EXTENSIVE THROUGHOUT THE UNITED STATES, BUT IT IS DIFFICULT OF ASSESS THE EXTENT OF DEPLOYMENT GAPS IN RURAL AREAS, GAO-06-426, May 2006, p. 22.

[22] $59.99 is the lowest monthly price for non-bundled high-speed internet service offered by Hughes Network Systems. In addition to the monthly charge, a 15-Month commitment is required as well as $399.98 in equipment and installation charges. See, http://agent.hughesnet.com/res/pricing.cfm (website visited on 02/15/07). Since most U.S. households can purchase broadband access from a satellite-based provider (as long as their house or apartment has a clear line of sight to the provider's satellite), I use $59.99 as the cut-off point for the demand from consumers without broadband access. I assume that the 15-month commitment and $399.98 equipment and installation charges approximately offset the $250 charge for a certified reception device for M2Z's free service.

[23] This is the area under the linear demand curve Price = 59.99 - 0.000011998 x Quantity.

[24] 5.05 percent is the average of the 10-year and 20-year interest rates per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

from M2Z's free service for consumers without prior broadband access is more than $12 billion over the period 2008 to 2022, as seen in Table Three below.

TABLE THREE
BENEFITS FROM M2Z'S FREE SERVICE
FOR CONSUMERS WITHOUT PRIOR BROADBAND ACCESS

NPV of Benefits from M2Z's Free Service for Consumers Without Prior Broadband Access (2008-2022) ($ million)	12,318.23

I note that if the benefits from M2Z's free service are assumed to accrue in perpetuity, I estimate that the net present value (as of 2007) of benefits from M2Z's free service for consumers without prior broadband access is more than $27 billion from 2008 onwards, based on discounting future benefits using an interest rate of 5.1 percent.

B.   Scenario 2: New Broadband USF Tax in the Absence of M2Z's Free Service

If a new broadband USF tax would be imposed on consumers of telecommunications services in the absence of M2Z's free service, then a straightforward way to estimate the benefits from M2Z's free service is to estimate the net present value of the avoided new broadband USF tax. I assume that in the absence of M2Z's free service, a new broadband USF tax in the annual amount of $500 million would be imposed on consumers of telecommunications services.[25] (As noted above, although the FCC does not require carriers to recover their USF contributions from consumers, in

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[25] A Senate bill introduced in 2006 provided for a $500 million annual broadband USF. See, S. 1583 [109th]: Universal Service for the 21st Century Act, text available at http://www.govtrack.us/congress/billtext.xpd?bill=s109-1583 (website visited on 02/21/07).

practice, consumers of telecommunications services usually end up paying for their carriers' contributions to the USF.)

Table Four below presents the net present value (as of 2007) of the savings from the avoided new broadband USF tax. As seen in Table Four, consumers of telecommunications services would save more than $5 billion in net present value over the period 2008 to 2022, assuming that future benefits are discounted using an interest rate of 5.05 percent.

TABLE FOUR
BENEFITS FROM M2Z'S FREE SERVICE
DUE TO AVOIDED BROADBAND USF TAX

NPV of Savings from M2Z's Free Service Due to Avoided Broadband USF Tax (2008-2022) ($ million)	5,172.33

The estimate of consumer benefits from M2Z's free service via increased broadband access presented under Scenario 2 (see Table Four) representing a lower bound for consumer benefits from M2Z's free service. This is because M2Z's free service would provide some benefits to consumers in addition to the benefits from the avoided broadband USF tax. That is, if a new broadband USF tax were imposed, consumers would still likely obtain some benefits from M2Z's free service; however, estimating the incremental benefits from M2Z's free service when a new broadband USF tax is imposed requires estimates of the level of broadband access that would be achieved by a $500 million annual program.

I also note that if the benefits from the avoided broadband USF tax are assumed to accrue in perpetuity, I estimate that the net present value (as of 2007) of benefits from

M2Z's free service is more than $9 billion from 2008 onwards, based on discounting future benefits using an interest rate of 5.1 percent.

VI. BENEFITS FROM ROYALTY PAYMENTS FOR SPECTRUM LEASE

M2Z proposes royalty payments for the spectrum that M2Z seeks to lease. According to M2Z's Application, M2Z would pay 5 percent of the gross revenues from its paid subscription service to the U.S. Treasury each year.[26]

I estimate the benefits to U.S. taxpayers from M2Z's proposed royalty payments by assuming that (1) the price of M2Z's paid subscription service would be $25 per month,[27] (2) fifteen percent of M2Z's customers would subscribe to its paid subscription service,[28] and (3) M2Z's customers would be acquired at the rate of growth of its network. I calculate the net present value (as of 2007) of M2Z's royalty payments by discounting future benefits in perpetuity at the interest rate of 5.1 percent. I also calculate the net present value of M2Z's royalty payments assuming M2Z acquires one million, five million, ten million and fifteen million customers.

The estimated royalty payments are presented in Table Five below. As seen in Table Five, I estimate that M2Z will make royalty payments ranging in net present value

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[26] See, M2Z Application, p. 4.

[27] As noted above, Comcast's regular monthly price for unbundled cable modem service is $59.95 per month. In addition, although M2Z's paid subscription service will offer a speed comparable to cable modem service (i.e., 3 Mbps), M2Z's paid subscription service will also be mobile as compared to cable modem service which is provided in a fixed location. For these reasons, an assumed price of $25 per month for M2Z's paid subscription service appears reasonable.

[28] This estimate is based, in part, on the ratio of paid subscriptions to total subscriptions for Internet service providers such as United Online. Thus, United Online has 4.9 million paid accounts out of 20.8 million total accounts for a ratio of paid accounts to total accounts of approximately 24 percent. See, UNITED ONLINE FORM 10Q, filed with the U.S. Securities and Exchange Commission, filed 11/9/06 for the period ending 9/30/06, p. 28.

from more than $35 million to more than $536 million from 2008 onwards, depending on whether it acquires one million to fifteen million customers.

TABLE FIVE
ROYALTY PAYMENTS FOR M2Z'S SPECTRUM LEASE

	1	5	10	15
Total M2Z Customers (million)	1	5	10	15
NPV of Royalty Payments for M2Z's Spectrum Lease (2008 onwards) ($ million)	35.76	178.81	357.61	536.42

I also perform a sensitivity test where I assume that thirty percent of M2Z's customers would subscribe to its paid subscription service. In this case, I estimate that M2Z will make royalty payments ranging in net present value from more than $71 million to more than $1 billion from 2008 onwards, depending on whether it acquires one million to fifteen million customers.

VII.   CONCLUSIONS

In this paper, I examine the likely impact on consumer welfare of M2Z's Proposal to provide wireless broadband access services. According to M2Z's proposal, M2Z will offer a free service, which will be comparable to basic DSL service, and will provide affordable access to broadband service to almost all U.S. households. Additionally, M2Z plans to offer a faster paid subscription service. Both the free and paid subscription services will increase the level of broadband competition in the country, providing significant benefits to U.S. consumers.

Given the uncertainty in predicting the effects of M2Z's entry, in order to provide a useful benchmark for the debate relating to M2Z's proposal, I have developed a very conservative framework to estimate the net present value of consumer benefits that will likely result from the first-order effects of M2Z's entry. In particular, I focus on three important first-order effects of M2Z's entry on consumers: (1) benefits to consumers of broadband services due to lower prices; (2) benefits from increased broadband access via either (a) the provision of broadband access to consumers without prior access to broadband or (b) an avoided new broadband USF tax; and (3) royalty payments for the spectrum to be leased by M2Z.

Thus, I am not explicitly accounting for numerous other potential consumer benefits from M2Z's service. For example, when estimating the benefits to consumers from increased broadband access, I only consider the benefits to consumers who subscribe to M2Z's free service but did not have prior broadband access. This ignores the benefits to consumers who choose to purchase M2Z's paid subscription service as well as benefits to consumers who had broadband access prior to M2Z's entry (e.g., consumers who had access to broadband but chose to subscribe to dial-up service). In addition, I only consider the effect of M2Z's entry on other broadband providers via reduced prices for broadband access. Moreover, I am not accounting for the significant but less tangible consumer benefits from increased innovation and investment in other industries as a result of increased and cheaper broadband access for U.S. consumers due to M2Z's service.

This very conservative approach to estimating the consumer benefits from M2Z's proposal suggests that M2Z's entry will likely result in a net present value ("NPV") as of

2007 of benefits to U.S. consumers of broadband and telecommunications services ranging from more than $18 billion to more than $25 billion.

_____   ___03/01/2007____

Professor Simon J. Wilkie   March 1, 2007

APPENDIX ONE: CONSUMER BENEFIT CALCULATIONS

BENEFITS FROM M2Z'S SERVICE DUE TO REDUCTION IN BROADBAND ACCESS PRICES

TABLE A-1
NET PRESENT VALUE OF BENEFITS FOR BROADBAND SUBSCRIBERS FROM REDUCED BROADBAND ACCESS PRICES

[1]	[2]	[3]	[4] = [3] x (100/95)	[5] = NPV (12 x [2] x [4] x 1)	[6] = NPV (12 x [2] x [4] x 5)
				NPV of Benefits for Broadband Subscribers from Reduced Broadband Access Prices ($ million) /4	
				Reduction in Monthly Broadband Price Due to M2Z Entry ($/month)	
Year	**Residential Broadband Subscribers (million)** /1	**M2Z Network Build-out (%)** /2	**Percentage of Total M2Z Customers Acquired (%)** /3	**1**	**5**
2008	59.16	11.11%	11.70%	79.01	395.04
2009	64.36	22.22%	23.39%	163.56	817.79
2010	68.89	33.33%	35.09%	249.86	1,249.30
2011	68.89	50.00%	52.63%	356.60	1,783.01
2012	68.89	66.67%	70.18%	452.40	2,261.99
2013	68.89	72.33%	76.14%	467.03	2,335.17
2014	68.89	78.00%	82.11%	479.18	2,395.91
2015	68.89	83.67%	88.07%	489.05	2,445.27
2016	68.89	89.33%	94.04%	496.84	2,484.19
2017	68.89	95.00%	100.00%	502.72	2,513.58
2018 onwards	68.89	95.00%	100.00%	9,378.84	46,894.22
NPV of Benefits (2008 onwards) ($ million) /5				**13,115.10**	**65,575.48**

Notes:

/1   Residential broadband subscriber forecasts for 2008-2010 are estimates used in M2Z's business plan. These estimates appear to be similar to estimates available from sources such as the Telecommunications Industry Association. See, http://www.tiaonline.org/business/media/press_releases/2006/PR06-22.cfm (website visited on 02/09/07). From 2011 onwards, the number of residential broadband subscribers is assumed to remain at the 2010 level.

/2   M2Z's Application commits M2Z to a network build-out requirement of 33% of the U.S. population within 3 years of license grant, 66% within 5 years, and 95% within 10 years. M2Z's network is assumed to grow linearly to meet these requirements.

/3   M2Z is assumed to acquire its assumed total number of customers at the growth rate of its network.

/4   The annual benefit for broadband subscribers due to M2Z's entry is based on either a $1/month or a $5/month one-time decline in broadband prices. The decline in broadband prices is assumed to occur in proportion to the percentage of total M2Z customers acquired. I consider this assumed price reduction to be conservative in light of the observed declines in the price of wireless telephone services following entry into the duopoly cellular markets beginning in 1995 (between 1994 and 2002, the average revenue per minute declined by approximately 77 percent). See, e.g., Thomas W. Hazlett (2003), Is Federal Preemption Efficient in Cellular Phone Regulation?, FEDERAL COMMUNICATIONS LAW JOURNAL, vol. 56, no. 1, Table 3.

/5   Net present value as of 2007 calculated using an interest rate of 5.1%, the 30-year interest rate per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

BENEFITS FROM M2Z'S FREE SERVICE DUE TO INCREASED BROADBAND ACCESS

SCENARIO 1: NEW BROADBAND USF TAX NOT IMPOSED IN THE ABSENCE OF M2Z'S FREE SERVICE

TABLE A-2
NET PRESENT VALUE OF BENEFITS FROM M2Z'S FREE SERVICE
FOR CUSTOMERS WITHOUT PRIOR BROADBAND ACCESS

[1] Year	[2] Annual Benefits from Free Broadband Access for Households Without Prior Broadband Access ($ million) /1	[3] M2Z Network Build-out (%) /2	[4] = NPV ([2] x [3]) NPV of Benefits from M2Z's Free Service for Customers Without Prior Broadband Access ($ million)
2008	1,799.70	11.11%	190
2009	1,799.70	22.22%	362
2010	1,799.70	33.33%	517
2011	1,799.70	50.00%	739
2012	1,799.70	66.67%	938
2013	1,799.70	72.33%	969
2014	1,799.70	78.00%	994
2015	1,799.70	83.67%	1,015
2016	1,799.70	89.33%	1,032
2017	1,799.70	95.00%	1,045
2018	1,799.70	95.00%	994
2019	1,799.70	95.00%	947
2020	1,799.70	95.00%	901
2021	1,799.70	95.00%	858
2022	1,799.70	95.00%	817
NPV of Benefits (2008-2022) ($ million) /3			12,318
NPV of Benefits (2008 onwards) ($ million) /4			27,174

Notes:

/1   Annual benefits based on the area under the following inverse demand curve for households without prior broadband access: Price = 59.99 - 0.000012 x Quantity, where price represents the monthly price of broadband access and quantity represents the number of households without broadband access. See Table "Inverse Demand Curve for Households Without Prior Broadband Access."

/2   M2Z's Application commits M2Z to a network build-out requirement of 33% of the U.S. population within 3 years of license grant, 66% within 5 years, and 95% within 10 years. M2Z's network is assumed to grow linearly to meet these requirements.

/3   Net present value as of 2007 calculated using an interest rate of 5.05%, the average of the 10-year and 20-year interest rates per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

/4   Net present value as of 2007 calculated using an interest rate of 5.1%, the 30-year interest rate per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

BENEFITS FROM M2Z'S FREE SERVICE DUE TO INCREASED BROADBAND ACCESS

SCENARIO 1: NEW BROADBAND USF TAX NOT IMPOSED IN THE ABSENCE OF M2Z'S FREE SERVICE

TABLE A-3
INVERSE DEMAND CURVE
FOR HOUSEHOLDS WITHOUT PRIOR BROADBAND ACCESS

[1]	[2]	[3]	[4]	[5] = ([1] - [3]) / ([2] - [4])	[6]	[7] = 12 x 0.5 x [1] x [4]
Price-Quantity Pair 1		**Price-Quantity Pair 2**				
Price ($/month):	Quantity:	Price ($/month):	Quantity:			
Lowest Monthly Price for Non-Bundled Hughes Network Systems High-Speed Internet Service. 15-Month Commitment Required. $399.98 Equipment and Installation Charge. [/1]	**U.S. Households Without Broadband Access** [/2]	**Monthly Price of Free Broadband Service. $250 Equipment Purchase.**	**U.S. Households Without Broadband Access** [/3]	**Slope of Demand Curve Based on a Uniform Distribution of Household Willingness to Pay** [/4]	**Estimated Inverse Demand Curve for Households with No Prior Broadband Access**	**Annual Benefits from Free Broadband Access for Households Without Prior Broadband Access**
$59.99	0	0	5,000,000	-0.000011998	Price = 59.99 - 0.000012 x Quantity	$1,799,700,000

Notes:

/1   Source: http://agent.hughesnet.com/res/pricing.cfm (website visited on 02-15-07).

/2   It is assumed that U.S. households lacking broadband access have a willingness to pay below $59.99/month. It is assumed that if the willingness to pay for broadband access for such households was $59.99/month or higher, they would be able to obtain broadband access from a satellite provider.

/3   It is assumed that 5 million U.S. households will lack broadband access from 2008 onwards. It is assumed that the number of homes that have access to cable high-speed data service is a reasonable estimate of terrestrial broadband access. In 2006, there were 107,811,000 homes passed by cable high-speed data service and an estimated 117,008,705 U.S. households. Thus, more than 9 million U.S. homes were not passed by cable high-speed data service. In addition, the growth in the number of homes passed by cable high-speed data service appears to be leveling off. Thus, the rate of growth in the number of homes passed by cable high-speed data service was 7.66 percent in 2004, 3.81 percent in 2005, and 2.15 percent in 2006. See, http://www.ncta.com/ContentView.aspx?contentId=60 (website visited on 02/15/07) for the number of homes passed by cable high-speed data service. The estimate of the number of U.S. households for 2006 was used in M2Z's business plan and appears consistent with historical data for U.S. households available from the Census Bureau.

/4   It is assumed that the monthly willingness to pay for households without prior broadband access is uniformly distributed between 0 and $59.99.

BENEFITS FROM M2Z'S FREE SERVICE DUE TO INCREASED BROADBAND ACCESS

SCENARIO 2: NEW BROADBAND USF TAX IN THE ABSENCE OF M2Z'S FREE SERVICE

TABLE A-4
NET PRESENT VALUE OF SAVINGS
FROM AVOIDED NEW BROADBAND USF TAX

Year	New Broadband USF Tax in the Absence of M2Z's Service ($ million) [1]	Net Present Value of Savings from Avoided New Broadband USF Tax ($ million)
2008	500	476
2009	500	453
2010	500	431
2011	500	411
2012	500	391
2013	500	372
2014	500	354
2015	500	337
2016	500	321
2017	500	305
2018	500	291
2019	500	277
2020	500	264
2021	500	251
2022	500	239
NPV of Savings (2008-2022) ($ million) [2]		**5,172**
NPV of Savings (2008 onwards) ($ million) [3]		**9,328**

Notes:

/1   A new broadband USF tax is assumed to be imposed in the amount of $500 million annually starting in 2008. This assumption is based on a Senate bill, S. 1583 [109th]: Universal Service for the 21st Century Act, that was introduced in 2006.

/2   Net present value as of 2007 calculated using an interest rate of 5.05%, the average of the 10-year and 20-year interest rates per the Office of Management and Budget as of January 2007.

/3   Net present value as of 2007 calculated using an interest rate of 5.1%, the 30-year interest rate per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07).

BENEFITS FROM ROYALTY PAYMENTS FOR SPECTRUM LEASE

TABLE A-5
NET PRESENT VALUE OF ROYALTY PAYMENTS
FOR M2Z'S SPECTRUM LEASE

[1]	[2]	[3] = [2] x (100/95)	[4] = 25 x 0.05 x 12	[5] = 0.15	[6] = NPV ([3] x [4] x [5] x 1)	[7] = NPV ([3] x [4] x [5] x 5)	[8] = NPV ([3] x [4] x [5] x 10)	[9] = NPV ([3] x [4] x [5] x 15)
					NPV of Royalty Payments for M2Z's Spectrum Lease ($ million) /5			
			Annual Royalty Payment Per Paid Subscriber ($) /3	Percentage of M2Z's Total Customers that are Paid Subscribers (%) /4	Total M2Z Customers (million)			
Year	M2Z Network Build-out (%) /1	Percentage of Total M2Z Customers Acquired (%) /2			1	5	10	15
2008	11.11%	11.70%	15	15%	0.25	1.25	2.50	3.76
2009	22.22%	23.39%	15	15%	0.48	2.38	4.76	7.15
2010	33.33%	35.09%	15	15%	0.68	3.40	6.80	10.20
2011	50.00%	52.63%	15	15%	0.97	4.85	9.71	14.56
2012	66.67%	70.18%	15	15%	1.23	6.16	12.31	18.47
2013	72.33%	76.14%	15	15%	1.27	6.36	12.71	19.07
2014	78.00%	82.11%	15	15%	1.30	6.52	13.04	19.56
2015	83.67%	88.07%	15	15%	1.33	6.66	13.31	19.97
2016	89.33%	94.04%	15	15%	1.35	6.76	13.52	20.28
2017	95.00%	100.00%	15	15%	1.37	6.84	13.68	20.52
2018 onwards	95.00%	100.00%	15	15%	25.53	127.63	255.26	382.89
NPV of Royalty Payments (2008 onwards) ($ million) /6, /7					$35.76	$178.81	$357.61	$536.42

Notes:
/1   M2Z's Application commits M2Z to a network build-out requirement of 33% of the U.S. population within 3 years of license grant, 66% within 5 years, and 95% within 10 years. M2Z's network is assumed to grow linearly to meet these requirements.

/2   M2Z is assumed to acquire its assumed total number of customers at the growth rate of its network.

/3 $15 annual royalty payment per paid subscriber based on an assumed $25 per month paid subscription and a 5% royalty rate. The assumed price of $25 per month appears reasonable in comparison to Comcast's regular monthly price for unbundled cable modem service of $59.95 per month. See, http://www.comcast.com (website visited on 02/28/07). The 5% royalty rate is based on M2Z's Application. See M2Z's Application, p. 4.

/4   15% of M2Z's total customers are assumed to be paid subscribers. This estimate is based, in part, on the ratio of paid subscriptions to total subscriptions for Internet service providers such as United Online. Thus, United Online has 4.9 million paid accounts out of 20.8 million total accounts for a ratio of paid accounts to total accounts of approximately 24 percent. See, UNITED ONLINE FORM 10Q, filed with the U.S. Securities and Exchange Commission, filed 11/9/06 for the period ending 9/30/06, p. 28.

/5   Royalty payments calculated assuming that M2Z acquires 1 million, 5 million, 10 million, and 15 million customers.

/6   Net present value as of 2007 calculated using an interest rate of 5.1%, the 30-year interest rate per the Office of Management and Budget as of January 2007. See, http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html (website visited on 02/15/07). From 2018 onwards, royalty payments assumed to remain at the 2017 level in perpetuity.

/7   If 30% of M2Z's total customers are assumed to be paid subscribers (i.e., column [5] = 0.30), then the net present value of royalty payments from M2Z's spectrum lease is $71.52 million, $357.61 million, $715.23 million, and $1,072.84 million if M2Z acquires 1 million, 5 million, 10 million, and 15 million customers respectively.

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California Institute of Technology Graduate Student Council: 1996-97 Mentoring Award.

California Universities for Research in Earthquake Engineering: "Social Economic and System Aspects of Earthquake Recovery and Reconstruction," co-PI with James Beck, Caltech, and Anne Kiremidjian, Stanford, $400,000 for 1997-1999.

National Science Foundation, SES Grant "Applied Mechanism Design," $38,113 for 2000-2002.

National Science Foundation, PEER Grant "A Decision Theoretic Approach to Evaluating Building Specific Losses," $75,000 for 2000-2002.

APPOINTMENTS

Executive Director, Center for Communication Law and Policy, USC Law School and: Professor of Communication, (Courtesy) The Annenberg School, University of Southern California, August 2005-

Professor of Economics, (Courtesy) University of Southern California, October 2006-

Senior Fellow, USC Annenberg Center for Communication March 2006-

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Chief Economist, Federal Communications Commission, Washington DC; 2002- 2003

Assistant Professor, California Institute of Technology; 1995-2002.

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Visiting Assistant Professor, Columbia University; 1992-93.

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JOURNAL ARTICLES

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PROFESSIONAL ACTIVITES

Editorial Board Member: *Journal of Public Economic Theory*, 1997- present.

Editorial Board Member: *International Journal of Communications*, 2006-.

Guest Editor, *Journal of Public Economic Theory* Vol 6 No. 4, October 2004.

Referee: National Science Foundation, *The American Economic Review, Econometrica, Economic Design, Economic Theory, European Transactions on Telecommunications, Games and Economic Behavior, The International Economic Review, The International Journal of Game Theory, The Journal of Economics and Management Strategy, The Journal of Economic Theory, The Journal of Economic Behavior and Organization, The Journal of Industrial Economics, The Journal of Regulatory Economics, Telecommunication Systems, and Theory and Decision.*

Committee Memberships: Program Committee, *Telecommunications Policy Research Conference* (TPRC): 2006-2008. Local Committee: 2002 *Social Choice and Welfare Society* Meetings, Pasadena. Session Chair: 1997 Summer Meetings of the *Econometric*

Society. Member of the Organizing Committee: "Workshop on Computer Science and Game Theory," section of the *Fourth International Conference on Game Theory*, SUNY Stony Brook, July 28-30, 1993. "Workshop on Implementation," section of the *Third International Conference on Game Theory*, SUNY Stony Brook, July 8-10, 1992. "Workshop on Cost Allocation and Transfer Pricing," section of the *Second International Conference on Game Theory,* SUNY Stony Brook, July 8-10, 1991